authority. The observed distances of the comet from stars were carefully corrected for refraction and parallax, a mean value of the refraction being employed, and the distances in the computation of parallax inferred from Clausen's ellipse. A comparison of the observations thus rigorously reduced with Clausen's orbit was then made, and it was at once evident that an orbit might be found to represent the observations much more satisfactorily than the ellipse in question. This Mr. Plummer proceeded to investigate, and the result is a parabolic orbit which accords as well with the whole course of observations as the limits of their errors will allow. The elements of this parabola are :—

Perihelion passage, 1683, July 13, c9c68, Greenwich M.T.

Longitude of Perihelion	85° 35′ 59″·5	Mean Equinox, 1683·c.
Longitude of Ascending Node ..	173 24 39·7	
Inclination of the Orbit	83 13 14·7	
Logarithm of Perihelion distance ..	9·7478656	

Motion Retrograde.

The sums of the squares of the errors are :—

	R.A.	N.P.D.
In Clausen's ellipse ..	337278″	224845″
In Plummer's parabola ..	29c89″	58394″

It would therefore appear that there is no reason to expect the return of the comet within the next few years, or to suppose that it is one of moderate period.

If I am not greatly mistaken, Clausen has merely reduced Flamsteed's observations on three days, and computed an orbit upon them by a general method, such as that given by Gauss in the *Theoria Motus*. The observations selected are almost indicated by the comparison with his elements.

I should add that the observations of Hevelius were likewise rigorously reduced, but being found greatly inferior to Flamsteed's in point of accuracy, it was considered that no advantage would be gained by employing them in the calculations for the orbit.

It is the intention of Mr. Bishop, to publish the details of Mr. Plummer's investigation in a separate form.

1870, *April* 7.

Studies on the frequency of Sun-spots, and on their connexion with the Magnetic Declination-variation. By Prof. Rudolf Wolf. (Translation.)

Denoting by r the Relative-number for the Sun-spot frequency introduced by me in the year 1850, by f the number of days with-

out spots, and by b the number of days of observation, I obtain for 1864–69 the following table:—

	1864.		1865.		1866.	
	r	$f:b$	r	$f:b$	r	$f:b$
January	57·5	0 : 31	48·3	0 : 30	33·3	0 : 31
February	47·2	0 : 29	44·8	0 : 27	39·4	1 : 28
March	67·3	0 : 31	40·7	2 : 28	27·2	0 : 29
April	30·0	2 : 29	32·5	1 : 30	18·9	2 : 30
May	40·9	0 : 31	37·5	2 : 31	15·0	6 : 31
June	58·3	0 : 30	36·3	2 : 30	18·3	3 : 30
July	57·2	0 : 31	29·7	2 : 31	10·2	9 : 31
August	57·9	2 : 31	40·3	0 : 31	14·0	5 : 31
September	30·5	1 : 30	22·9	7 : 30	8·0	13 : 30
October	35·5	0 : 31	18·5	10 : 31	14·6	5 : 31
November	59·1	0 : 28	24·7	4 : 27	9·3	16 : 30
December	24·1	1 : 24	13·3	9 : 28	1·6	26 : 30
Year	47·1	6 : 356	32·5	39 : 354	17·5	86 : 362

	1867.		1868.		1869.	
	r	$f:b$	r	$f:b$	r	$f:b$
January	0·0	29 : 29	12·2	13 : 25	72·4	0 : 27
February	0·8	26 : 28	16·4	5 : 28	72·4	1 : 24
March	10·8	11 : 31	28·7	3 : 30	65·3	0 : 28
April	5·8	20 : 30	39·4	0 : 30	46·5	1 : 30
May	3·3	24 : 31	30·3	3 : 31	115·8	0 : 30
June	1·6	26 : 30	34·7	2 : 30	120·4	0 : 30
July	5·3	18 : 31	32·2	10 : 31	65·1	1 : 31
August	5·9	19 : 31	38·6	0 : 31	93·2	0 : 30
September	10·6	15 : 30	52·6	1 : 30	88·5	0 : 30
October	14·2	13 : 31	60·5	0 : 29	62·4	0 : 30
November	10·3	9 : 30	67·9	0 : 21	85·7	0 : 24
December	27·5	6 : 24	68·4	0 : 29	122·1	0 : 25
Year	8·0	216 : 356	40·2	32 : 345	84·1	3 : 339

One recognises herein, at the first glance, the minimum of 1867 according with my Sun-spot period of $11\frac{1}{9}$ years, and from that date the rapidly increasing Sun-spot frequency. By the empirical formula which, since 1859, I proposed for various points in order from r to deduce the declination-variation b, I give here, only by way of example, the calculated formula 1852–61 for Christiania,—

$$v = 0'{\cdot}0413\, r + 4'{\cdot}921$$

This gives the following table, where v denotes the variations calculated by the formula, v' the values resulting from the actual

observations, communicated to me by Messrs. Mohn and Fearnley.

	1864.	1865.	1866.	1867.	1868.	1869.
v	6′·87	6′·26	5′·64	5′·25	6′·58	8′·39
v'	6·00	5·72	5·70	5·69	6·65	7·82

It is hardly necessary to remark that the constants of the formulæ may, by means of the whole series of the Christiania Observations, easily be altered so as to obtain a yet better agreement. I prefer, however, for the present not to make this change.

Zurich, March 28, 1870.

Observations of Lunar Eclipse, Jan. 17, 1870.

By J. Tebbutt, jun.

The lunar eclipse of the 17th instant was remarkably well seen here. The Moon was overspread with very thin filmy cloud till about $11^h\ 43^m$, but the diminution of her brilliancy from that cause was very slight. She remained unclouded during the rest of the phenomenon. No decided defalcation of light was noticed on the eastern limb till $10^h\ 41^m$, but at $10^h\ 52^m$ the effects of the penumbra were very marked. The following are the local mean times of the different phases as near as they could be observed, it being a most difficult matter to fix the precise instants of the contacts owing to the ill-defined character of the shadow:—

	d	h	m	s
First contact with the shadow	17	11	1	19
Beginning of the total phase	..	12	0	29
End of the total phase	..	13	38	53
Last contact with the shadow	..	14	38	58

At $11^h\ 29^m$ the shadow assumed a light copper tint, except at its periphery, where it was of a very dark green. The copper tint, as seen in the telescope, appeared to extend even to the filmy cloud which lay along the Moon's eastern limb. At $11^h\ 43^m$, when the Moon shone unclouded, the details on the obscured portion of the lunar surface began to be perceptible in the telescope. These became gradually more distinct, and it was soon observed that the dark body of the Moon was surrounded by numerous telescopic stars, and that many occultations would occur during the total phase. Several of these phenomena were observed with tolerable accuracy; some of the stars, however, were too faint for accurate observation. The following occultations were recorded:—